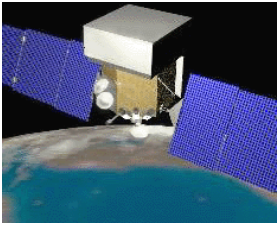


Data Acquisition System Simulation Requirements

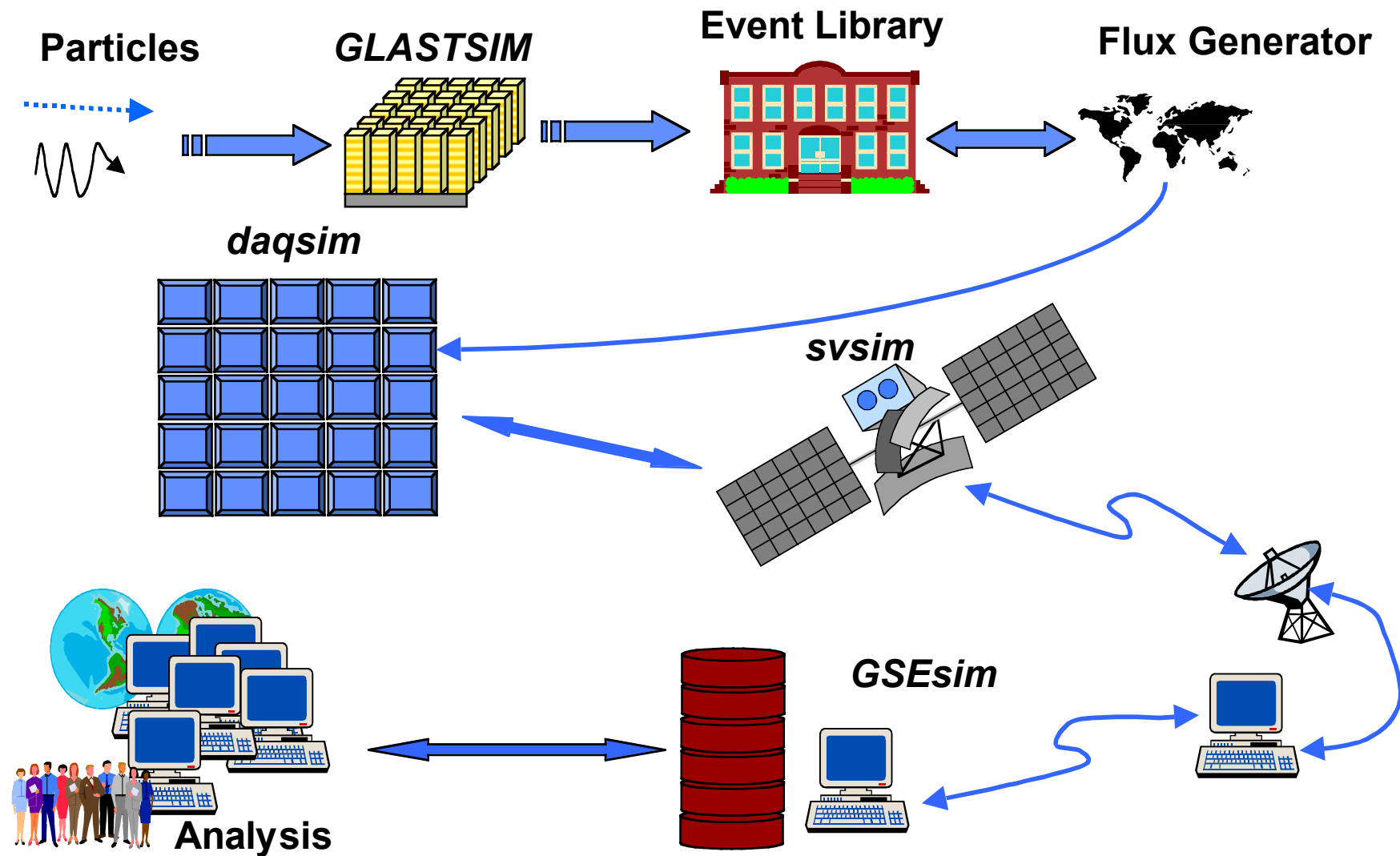
Roger Williamson

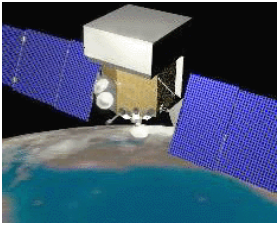
GSFC

March 22, 2000



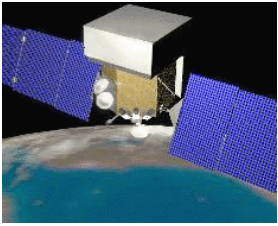
DAQ Simulation Model





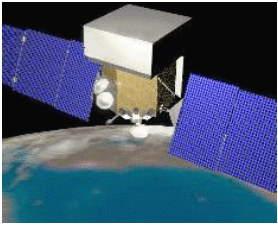
DAQ Simulation Model Elements

- ◆ Particle Library --- Representative particles
- ◆ GLASTSIM
 - 16 tower instrument
 - In future add detector noise, performance models
- ◆ Event Library
 - Hit addresses
 - Pulse heights
 - Particle data: input/output
- ◆ Flux generator --- Cosmic ray model, celestial gamma ray, gamma ray burst, Poisson statistics, orbit time variation
- ◆ daqsim --- Simulates DAQ
- ◆ svsim (Space Vehicle)
- ◆ gsesim (Ground data systems)
- ◆ Analysis



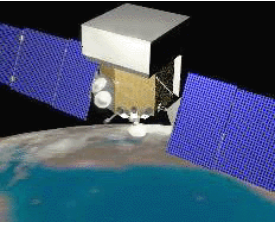
DAQ Simulation Flux Generator

- ◆ Event library input
- ◆ Real world models for
 - Cosmic rays
 - Celestial gamma rays
 - Gamma Ray Bursts
- ◆ Poisson statistics generator for time dependence
- ◆ Orbit model
 - Long term and orbit average dependence
 - Used to generate average power requirements where power is event rate dependent
- ◆ Test particle selector for special studies
 - Heavy ion effects
 - Inter-tower gaps



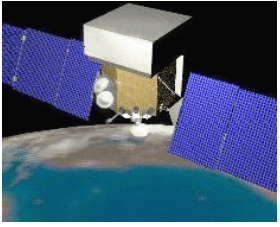
DAQ Simulation Event Library

- ◆ Events cover the range of *Flux Generator* requirements
- ◆ Simulation output
 - Particles: primary/secondary, type, energy, dE/dx , true track
 - Hit addresses, Fast-OR, TOT
 - Energy deposition and location for CAL log hits
 - CAL ADC, 4 channel and discriminator outputs
 - ACD energy deposition, and location
 - ACD discriminator outputs and PHA ADC values



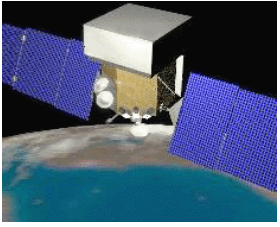
DAQ Simulation Requirements Doc

- ◆ Subsystem --- what subsystem is simulated
- ◆ Inputs --- what are the inputs to the simulation model
- ◆ Outputs --- what are the simulation data outputs to the next simulation element
- ◆ Metrics --- end result for this portion of the model (e.g. power consumption, memory usage, data flow rates)
- ◆ Description of the model including purpose
- ◆ Range --- the range of elements for input, output, modeled
- ◆ Resolution --- of the data elements (e.g. 12 bit PHA)
- ◆ Options --- describe the options for architecture, component selection,...



Why?

- ◆ DAQ readout simulations to size the bandwidth and model the function
- ◆ Establish the noise input to the DAQ (ACD veto noise, ...)
- ◆ Define, develop, test Level 1 Trigger
- ◆ Define, develop, test Level 2/3 Trigger
- ◆ Determine CPU cycles required per event
- ◆ Determine electrical power required
- ◆ Determine bandwidth requirements
- ◆ Input to TKR, CAL X,Y orientation proposal
- ◆ Provide realistic data challenge to analysis programs



Issues

- ◆ Two strip hits in TKR simulations
- ◆ Non-L1T events should be included in library
 - ACD Veto activity
 - Increased TKR hits and CAL noise
- ◆ Addressing scheme should match DAQ readout format
- ◆ Tracker and Calorimeter X,Y orientation